

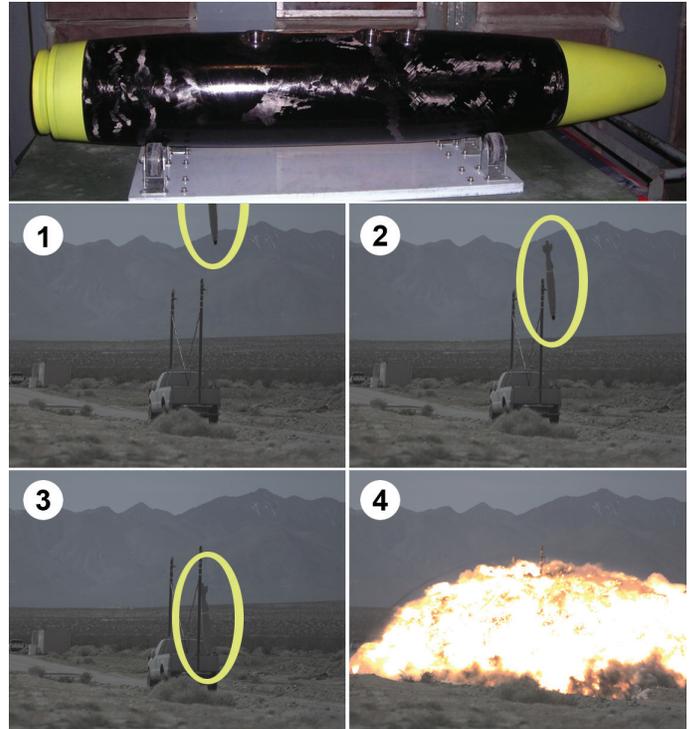
## Joint Direct Attack Munition (JDAM)

### Executive Summary

- The Navy established the Direct Attack Moving Target Capability (DAMTC) as a program of record in February 2010 and competitively selected Laser Joint Direct Attack Munition (LJDAM) as the non-developmental material solution. The program completed the final part of the Integrated Test (IT) in April 2011 following a January 2011 Operational Assessment Report and subsequent low-rate initial production (LRIP) decision. A brief Developmental Test (DT) program is nearing completion prior to the commencement of Operational Testing (OT) in November 2011.
- The Navy released 11 LJDAM weapons in FY11 to complete the IT and will complete a six-weapon DT flight test program to confirm performance of a redesigned laser sensor lens and optics assembly prior to OT.
- The Precision Lethality Mark 82 (PL Mk 82) is a Quick Reaction Capability program created in response to a Joint Urgent Operational Need (UON) for a low collateral damage weapon. The Air Force completed a series of arena, sled, and live flight tests on the PL Mk 82 to support a fielding decision expected to take place in October 2011. DOT&E published an Early Fielding Report on weapon performance in September 2011. The report categorized the weapon as effective in precision strike and reducing collateral damage compared to a steel-case Mk 82 bomb.

### System

- The Joint Direct Attack Munition (JDAM) is a low-cost, autonomously controlled, adverse weather, accurate guidance kit tailored for Air Force/Navy general purpose bombs to include:
  - 2,000-pound Mk 84 and BLU-109 bombs
  - 1,000-pound Mk 83 and BLU-110 bombs
  - 500-pound Mk 82, BLU-111, BLU-126, and BLU-129/B bombs
  - A GPS-aided inertial navigation system provides primary guidance to the weapon. Augmenting the JDAM inertial navigation system with GPS signals enhances accuracy.
- Guidance and control designs enable accuracy of less than 5 meters when GPS is available and less than 30 meters when GPS is absent or jammed after release.
- The LJDAM provides an increased capability to attack moving targets. In addition to retaining the precision of JDAM, the LJDAM provides enhancements for moving target attacks, precise laser target designation to eliminate Target Location Error, capability to operate beneath a cloud layer, and ability to select weapon impact angle in combination with laser guided precision.
- DAMTC uses LJDAM with the updated Block 8 Operational Flight Program (OFP) as its material solution for a Navy and Marine Corps dual-mode weapon. This



is a non-developmental program using LJDAM, whose original capability was restricted by a less-developed OFP and limited testing due to the program being fielded as part of an UON. The latest weapon OFP is intended to expand operational capability to maneuvering targets and increase overall effectiveness and suitability across the spectrum of employment modes.

- U.S. Central Command generated a Joint UON requesting a high lethality low collateral damage composite case variant of the Mk 82 with precision capability. The Air Force created the PL Mk 82 using a composite material and modified tungsten explosive fill. The warhead is compatible with JDAM and LJDAM guidance kits and is designated the BLU-129/B.

### Mission

- Combatant commanders use JDAMs employed by fighter, attack, and bomber aircraft, to engage targets day or night, in all weather at the strategic, operational, and tactical levels of warfare.
- Combatant commanders employ JDAM against fixed and relocatable soft and hard targets, to include command and control facilities, airfields, industrial complexes, logistical and air defense systems, lines of communication, and all manner of battlefield forces and equipment.
- Navy and Marine Corps fighter and attack aircraft employ JDAM and LJDAM to engage stationary targets in all weather,

as well as to reactively target stationary and moving targets. The moving and maneuvering target capability of DAMTC is intended for use in Close Air Support, Strike Coordination and Armed Reconnaissance, and Time Sensitive Target missions.

## Major Contractor

The Boeing Company, Integrated Defense Systems – St. Charles, Missouri

## Activity

### DAMTC

- The Navy established DAMTC as a program of record in February 2010, selecting LJDAM as the non-developmental material solution. As a non-developmental program, the IT and added DT for the lens change are the only test phases prior to commencement of OT. DOT&E put DAMTC on oversight, as it was previously fielded under a UON, with a less-developed OFP and very limited OT testing. Additional testing will verify expanded LJDAM capability and operational employment.
- Naval Commander, Operational Test and Evaluation Force (COTF) completed its Operational Assessment (OA) in January 2011 supporting an LRIP decision made later that month. Data from eight IT weapon releases conducted in FY10 and an additional seven releases from an earlier LJDAM Quick Reaction Assessment were used as part of the OA.
- Air Force operational user information from LJDAM field employment showed significant degradation of the laser sensor lens used on DAMTC when deployed in harsh environments (such as Afghanistan). The Navy initiated a search for a replacement material and Boeing developed a Sapphire lens to replace the existing lens.
- The Navy completed the IT phase with the release of 11 weapons in FY11. Results from these tests will support an Operational Test Readiness Review (OTRR) scheduled for early FY12.
- The Navy will conduct a six-weapon DT phase, using side-by-side comparison testing between the two lens types, immediately prior to the OT Phase to ensure the Sapphire lens has no negative impact on system effectiveness. A successful DT phase will verify IT data and ensuing conclusions are valid and allow Operational Testing to commence.
- DOT&E approved the DAMTC OT Test Plan and Integrated Evaluation Framework; test execution will begin upon successful conclusion of the DT phase and subsequent analysis.

### PL Mk 82

- The Air Force completed a rapid fielding recommendation for the PL Mk 82.
- The program office and Air Force Operational Test Center (AFOTEC) collaborated on seven arena tests and two sled tests to characterize warhead performance and to help evaluate effectiveness requirements related to lethality. AFOTEC flew a series of four live weapon open-air flight tests at Eglin AFB, Florida, and the test range at Naval

Air Weapons Center China Lake, California, to evaluate the end-to-end performance of the PL Mk 82 warhead in both the JDAM and LJDAM configurations. F-16 and F-15E aircraft employed the weapons from operationally representative attack profiles.

## Assessment

### DAMTC

- Results from the OA and the FY11 releases from IT (event IT-C1) indicate that the LJDAM has the potential to meet DAMTC requirements.
- DAMTC's results through IT-C1 demonstrate a Circular Error Probable (CEP) inside the threshold requirement of six meters against maneuvering targets.
- Preliminary DT results using the new Sapphire laser sensor lens and optics assembly indicate highly comparable sensor detection range to the previous material, and the Sapphire lens is expected to provide improved reliability in harsh environments during its intended service life.
- Elapsed testing time is currently insufficient to determine the impact of the new material on reliability. However, laboratory environmental tests results demonstrated Sapphire lens performance met system-level requirements.
- Review of the current DAMTC test strategy indicates a properly resourced program for the remainder of the DT and OT phases.

### PL Mk 82

- DOT&E published an Early Fielding Report on weapon performance in September 2011; the report categorized the weapon as effective in precision strike and reducing collateral damage compared to a steel-case Mk-82 bomb.
- All four PL Mk 82 flight tests were successful, with guidance to a very accurate impact (less than 10 feet) and high order detonation of the PL Mk 82 warhead.
- Although the PL Mk 82 did not meet the desired design lethality, it approximates the steel-cased Mk 82 bomb lethality while reducing collateral damage relative to the Mk 82 by nearly a factor of two.
- PL Mk 82 met its perforation requirement.

## Recommendations

- Status of Previous Recommendations. The Navy is completing the FY10 recommendation by providing adequate time to analyze the results of the last IT weapons prior to initiation of OT. The Navy also delayed OT in order to examine the comparability of the Sapphire lens with the original material in an added DT phase.

- FY11 Recommendation.
  1. The Navy should initiate and conduct OT only after adequate confidence has been achieved during the DT phase that the new lens material and optics assembly will not degrade performance seen in IT-C1 and will improve current reliability.

# AIR FORCE PROGRAMS